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ABSTRACT

Research indicates that people have two distinct information processing modalities, one for verbal material and one for nonverbal material. The nonverbal mode is used for visual images and is characterized by creative and relatively undisciplined associations. The verbal mode deals with abstract stimuli and is restrained by logic and the need to process information sequentially. Use of a particular mode can be controlled to a great extent by the concreteness of the message stimulus, with concrete symbols handled nonverbally and abstract ones verbally. Since reasoning is related to this dual coding theory, a limited theory of fallacy has been developed, suggesting two kinds of fallacies: those that depend on an increase in concreteness, and those that are caused by excess abstractness. Though limited in scope, this theory promises to be testable. (Author/RL)

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SYMBOLIZATION AND FALLACY

By

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Abstract

This paper reviews research which indicates that people have two distinct information processing modalities: one for verbal material, and one for nonverbal. The nonverbal mode is used for visual images, and is characterized by creative and relatively undisciplined associations. The verbal mode deals with abstract stimuli, and is restrained by logic and the need to process information sequentially. Use of a particular mode can be controlled to a great extent by the concreteness of the message stimulus: concrete symbols are handled nonverbally, and abstract ones verbally. Reasoning is related to this dual coding theory, and a limited theory of fallacy is suggested. Fallacies of two kinds are discussed: those which depend on an increase in concreteness, and those which are caused by excess abstractness. Though limited in scope, the theory promises to be testable.

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SYMBOLIZATION AND FALLACY

Fallacies are not well understood. We have no difficulty in compiling lists of them, or examples of them, or even accusations of them, but beyond the formal/material distinction, we have no real theory of fallacy. By this, I mean that our understanding of what makes something a fallacy is not really advanced by our classifications. Appeal to authority, for example, usually appears both on lists of fallacies, and on lists of desireable argument strategies. Post hoc ergo propter hoc is a charlatan's tool fo obscuring causality, while only an upright Aristotelian would use sign reasoning to the same end. Analogies are fallacious when they stretch too far, but wondrously enlightening when they stretch far enough. The series 'A is B, C is B, so A is C' demonstrates classically bad logic and poetically profound consubstantiality with one and the same conclusion.

Given these vast opportunities for mistaking a good argument for a bad one, I think that the way we usually teach fallacies is quite revealing. Ordinarily, we define and explain the fallacy--establishing the proper mental set in our students or readers--and then present some truly wretched arguments as examples. The preliminary explanation makes it easy to spot the fallacy, and so teacher and student happily occupy common ground. I have no argument against either the teaching method or the examples; I only wish to point out that fallacies seem usually to be discussed under very presumptive conditions and with extreme instances. This environment encourages us to think that we can examine an argument--represented as a paragraph or a few sentences--and say whether it is or isn't a fallacy. In contrast, I believe fallacies are not detectable by looking at text. We will do better, in my opinion, to consider how those sentences are understood, and this is only easy when examples are extreme.

The Oxford English Dictionary says that a fallacy is "a deceptive or misleading argument." An argument can only be deceptive for a person, can only mislead an individual. So the defining characteristics of fallacy refer not to argument form,

but to argument reception. As with argument of any kind, a message can only stimulate a fallacy; the actual fallacy is a cognitive event (see Hample, 1980). The idea of deception implies more than this, however. It also suggests the existence of an external standard for a given argument: to say that someone has been misled is to say that he/she didn't arrive at the "proper" destination. If truth is only obvious in extreme cases--say, perfect demonstrations or neon fallacies--then this external standard will usually depend very much upon who is applying it. Therefore, the critical event in labeling something as a fallacy is not the comparison of a rhetorical text to a set of formal definitions, but involves the comparison of one person's cognitions with another's.

A thorough-going theory of fallacy must therefore concentrate on cognition. If we are to say confidently that a given argument is fallacious, we must be able to point to particular message characteristics which reliably stimulate certain improper cognitions. Setting aside (as too broad to be considered here) the question of what is a proper pattern of thought, we are left with the need to relate message stimuli to information processing. This, of course, is not a small task either. Though this paper's main focus will be on nonverbal information processing, the results of some more general research on cognition at once establish the context and display the promise of a cognitive approach to argument.

A fundamental finding is that people remember a sentence's meaning much more accurately than its wording. Harris (1979) found this to be true for metaphors, and others (Brewer, 1977; Harris & Monaco, 1978) report that subjects remember the implications of passages as though the inferences had been explicitly stated. Fillenbaum (1966) says that recognition errors in a sentence-memory task tend to preserve meaning, even after exact wording has been lost. One implication of these results is to support the contention that the text of an alleged fallacy will probably not yield all the information necessary for us to make a final judgment of it.

In addition to considering the cognitive stimuli (i.e., the message) we must therefore examine the cognitive system which receives it. This system, variously labeled as script, schema or inference pattern, interprets the message. The interpretation is a constructive process, and reconstruction will be required if any of the information in memory is to be used as the basis of a response or action. The message is altered to make it fit the cognitive structure more conveniently (Bartlett, 1932).

Keenan and Kintsch (1974) demonstrated some of these effects. Their subjects read paragraphs which seemed to require that an inference be made in order for the paragraph to be comprehensible. An immediate posttest was given, in which subjects verified statements has having been in the paragraph or not. They took longer to decide about the implied statements than the explicit ones. But when the posttest was delayed for 20 minutes, the difference in reaction time disappeared. Apparently, the required inferences were made and stored during the delay period, and people were unable to tell what was text and what was interpretation.

A very large number of studies could be summarized here to show the integrative and constructive powers of memory (e.g., Franks & Brnasford, 1972; Johnson, Bransford & Solomon, 1973; Marschark & Paivio, 1977; Christiaansen, 1980; Haviland & Clark, 1975). Bransford, Barclay and Franks (1972) summarize this position, at least in terms of verbal materials: "New information is assimilated into the existing structures one has in mind. Depending upon the context into which they are assimilated, sentences can have semantic implications that extend beyond the information they directly express" (p. 206). Later in this paper, I will show that the same effects occur for nonverbal materials as well.

Given the powerful and active intervention of memorial structure into the process of message reception, it should come as no surprise that arguments are not pristinely imprinted on their audiences. Investigators interested in reasoning errors have often found apparent fallacies to be due to unanticipated constructive

interpretation of the argument. Henle (1962; 1978) and Ceraso and Provitera (1971) emphasize the need to understand what premises have actually been used in problem solving before judging the quality of the reasoning. Cronen and Mihevc (1972) sound similar cautions in our own field.

If a wrong conclusion occurs because a premise has been ignored or distorted, is this a problem of logic or comprehension? Scribner (1975) discovered that many of her West African villagers could not repeat the meaning of a syllogism's premises, even after hearing it three times. Geis and Zwicky (1971) report that 'if P then Q' is often interpreted as a biconditional--that is, people think it also means 'if not P then not Q.' This is formally invalid, but often true (try: 'if you clean up your room, I'll give you a quarter'). So when someone "fallaciously" concludes 'not Q' from 'if P then Q, not P' is this really a fallacy, or does the "error" result from the premise conversion? (Note that the conclusion is fine if it proceeds from 'if not P then not Q, not P.') To say that someone has committed a fallacy, therefore, we must know which premises were used and how they were processed: "Observing a failure on the part of the subject to match some external criterion established by the experimenter is uninformative with respect to the issue of whether the subject's logic is at fault or his understanding of the problem differs from that of the experimenter" (Pitz, 1975, p. 134).

This opening section has only skimmed the pertinent literature (for a more thorough effort, see Hample, 1979), but I hope it has shown the need for fallacies to be considered cognitively. Any response to an argument occurs only after the argument has survived its stay in short term memory (a visit measured in milliseconds) and has been moved securely into long term storage. Therefore a full understanding of fallacy must involve memory. Particularly, we must know something about the coding, processing and retrieving of message information. This paper takes as its topic one kind of coding in memory: nonverbal, especially for visual images. In the sections that follow, I will first review the basic tenets and evidence for

dual coding theory, then relate nonverbal coding to reasoning processes, and finally try to generate a limited theory of fallacy based on dual coding theory.

Dual Coding

Dual coding theory is almost wholly the product of Allan Paivio, a Canadian psychologist, and his colleagues. The fullest statement of the theory is Paivio (1971), though Paivio (1978) is also informative, and might be a gentler introduction. The theory's basic idea is that we have two different information processing systems: one for verbal materials, and one for nonverbal. Incoming information can be coded in either or both systems, as we will see. Certain kinds of information--visual perceptions and very concrete verbal utterances--are usually coded in both systems, and can be processed in either. When something is registered in both systems, it is said to be dual coded. For example, if you were to see a friend's car on the street, you might store both an image of the car, and a verbal label ("Steve's VW"). In spite of the theory's name, it tends to concentrate on the nonverbal coding system, especially for visual images, and so will I. However, it is a general theory of information processing, and so covers the verbal system as well.

We all have two memorial systems: one verbal and one nonverbal. The nonverbal system stores images, and the verbal system words. They each use different styles of information processing. The verbal system is linear, sequential, ordered. Words enter the system in an order, and ideas are processed in sequence. Memory for verbal material is very dependent on order: try reciting the alphabet backwards, or recalling every other word of a simple sentence. These tasks are possible, but very hard, because they violate the usual orders. The verbal memory code is specialized for sequential material, and so does better than an image-based memory code for series of things (Paivio, 1971, ch. 7). The nonverbal coding system, on the other hand, processes information in parallel. If you generate an image of your office, you can "look" at it all at once, in any order or from any vantage

point you like. This is not true for a well-remembered poem: even to pull out a few lines from its ending, most people have to quickly scan from the opening line. Visual imagery can be forced into a sequential form (imagine yourself walking down a familiar hallway), but it is usually spatial. Verbal thought, however, is linear (Paivio, 1971, chs. 2&4).

This contrast between directional verbal thought and nondirectional imaginal thought is illustrated in some paired associate studies reviewed by Paivio (1971, pp. 276-285). Subjects were given lists, composed of word pairs (these are the paired associates), and instructed to memorize the lists. The pairs were always presented in the same order so that the first word served as the simulus for the second. Some of the pairs were made up of very concrete words, which as we will see are processed in the nonverbal system; the other pairs were abstract, and so were processed verbally. When subjects had learned to produce the right response word (R) to each stimulus word (S), they were then required to do the task backwards: that is, to produce S in answer to R. This was very difficult for the verbally processed abstract pairs, but relatively easy for the imaginal pairs. Thus, the verbal learning seems to have been directional and asymmetrical, while the nonverbal processing was nondirectional, with symmetrical associations.

Though the implications of all this will be discussed later, it may be helpful for readers to notice, as Paivio (1971, ch. 4) does, that the distinction between verbal sequential processing and nonverbal processing corresponds nicely to Langer's contrast between discursive and nondiscursive communication. More directly relevant to this paper is the pregnant observation that images are "responded to configurally," while verbal processing "in contrast" uses induction and deduction (Wyer & Carlston, 1979, pp. 41-42). In any case, it is plain that material will be stored, construed, integrated and processed differently in the two systems.

An essential point in the theory is that we can predict which type of coding will be done for certain kinds of stimuli. More or less by definition, words high in imagery will be processed nonverbally. Usefully, imagery is correlated

very closely with concreteness (Paivio, 1971, pp. 78-81), so that we may use ratings of either concreteness or imagery to predict how a message will be coded. Paivio (1971, p. 245; cf. p. 59) remarks that concreteness "provides the only semantic definition of imagery as a process." Nonetheless, we need to remember that the key variable is imagery, not concreteness: when measurements of both are available, partial correlations with learning clearly show that imagery is the controlling force (Paivio, 1971, pp. 257, 266-267; Marschark & Paivio, 1977). Another way of expressing all this is that the more abstract a stimulus is, the more likely it is to be coded only verbally. Dominowski and Gadlin (1968) used a paired associate task where subjects learned to associate numbers with various stimuli. The stimuli, in order of increasing abstraction, were the picture of an object, the object's name, or the name of the object's category (e.g., animal). Subjects were asked to describe their memorial strategies. When the stimulus was a picture, 34% of the subjects used imagery, and only 7% used a verbal technique. For object names, 23% used imagery, and 18% verbal means. Category names produced 13% imagery and 19% verbal. Jorgensen and Kintsch (1973) also report evidence that visual imagery is a spontaneous reaction to concrete stimuli. Concreteness and abstractness can be reliably measured by semantic differential type ratings of words and passages, or by a priori orderings, such as object-picture-name.

Of course, whether something is coded in verbal or imaginal form, it is coded as meaning (or equivalently, the memory code for a particular item mediates learning). Paivio (1971, ch. 3; 1978, pp. 380-382) presents a three-tiered theory of meaning. After a stimulus word moves out of short term memory, it begins the first stage, which is the <u>representational</u> process. Here, the stimulus activates some representation (verbal or nonverbal, depending on which system is being used for coding), which already exists in long term memory. In nonverbal coding, a visual image might be activated and matched to the new stimulus. At this stage of meaning, one can feel recognition or familiarity, but little more (Paivio, 1971,

pp. 81-83). Second is the referential processing, where the coding modes are first coordinated. A visual image is linked to its name or other verbal reference, and a sufficiently concrete verbal stimulus would evoke its appropriate image. Not all words, of course, activate images (try 'epistemology'), and a few images may not have clear verbal references, but dual coding of images and concrete expressions is usual. Thus referential processing consists of making references from one code to the other. The final stage is associative. Here patterns of association occur in either mode. Words elicit other words (as in free association techniques), and abstract words tend to develop their meaning through intraverbal associations. Images, too, can generate other images: one visual boyhood memory can lead to another, or for some people, the visual memory of a good meal might activate an olfactory image as well. Images may also "fill in" with additional details--that is, with inferences. As we have already emphasized, images are associated spatially, while words associate sequentially.

As this theory of meaning implies, the two coding modalities are not completely independent. When material is dual coded, task characteristics may strongly influence whether subjects work through their verbal or nonverbal system (Paivio, 1978, p. 387). Coordination is obviously required whenever subjects must make verbal responses after nonverbal processing; this underscores the need to have a verbal code connected with an image (Paivio, 1971, ch. 7). Abstract verbal tasks are "more likely to restrict the subject to the verbal system alone" (Paivio, 1971, p. 389); nonetheless, it is possible to force subjects to use images even in tasks which seem naturally to be abstract and verbal. Werner and Kaplan (1963, pp. 454-466) report results for some interesting studies in which subjects were asked to form images for compound sentences using "because" or "if" (e.g., "He is intelligent because he is cautious"). Subjects showed some success for both words, though results for "if" were disappointing. The point is that even when coordination is not natural, it may be possible. And it is natural in many cases, particularly for the image/concrete word representations noted above.

Paivio (1978, p. 380) summarizes the two systems' relationships when he explains that they are

> independent but interconnected. Independence implies that perceptual and cognitive activity can go on in one or other system alone, or that both systems could be active concurrently. Thus, one can observe and take account of the objects and events in a social situation while carrying on a conversation that may be entirely unrelated to that situation. The same freedom does not apply within symbolic modalities, however, since one can not read a verbal message efficiently while carrying on a conversation on an unrelated topic.

Earlier, he had noted that the two systems "interact continually in any but the simplest of tasks"(Paivio, 1971, p. 38). But none of this should be taken to imply that the coordination is point-by-point, as would be the case if each inferential step in one system were cross-checked in the other. The interconnections between the codes seem to be largely referential and not associational, so that one system can input to the other and receive intelligible output without necessarily monitoring the actual reasoning. The significance of the fact that either system can function independently of the other is magnified by the previously-noted claim that the two systems function differently (i.e., in series or in parallel).

The last major theoretical point to be made in this summary of dual coding theory is that the theory is extremely comfortable with the constructive approach to memory mentioned in the introductory portion of this paper. As a matter of fact, some attention to imagery seems required in any full statement from the memory constructivists. Much of the original evidence seems to involve imaging. A typical example is Bransford, Barclay and Franks (1972). They found subjects unable to distinguish inference from message (the constructive memory effect), using sentences like "three turtles rested on a floating log, and a fish swam beneath them." This sentence is very easy to image, and one might reasonably

assume that results most clearly point to constructive processes in the nonverbal system in particular. Similarly concrete materials were used by Clark (1977), Haviland and Clark (1975), Bartlett (1932) and Johnson, Bransford and Solomon (1973), for example; all these are studies which help establish that memory is inferential. Since other work explicitly shows constructive effects with abstract materials (Franks & Bransford, 1972; Marschark & Paivio, 1977), we may conclude that both coding modalities function integratively and constructively.

A closely related explanatory theory that will be useful later in this paper is script theory (Abelson, 1976). We interpret events, actions and utterances by comparing them with mental scripts describing what we think happens in a particular situation. These scripts involve both picture and caption in their constitutive vignettes. Once a particular script is activated, it expands the meaning of, and associates significance to, whatever actions or utterances are perceived. An ambiguous act--e.g., one man handing money to another--can be variously understood as drug peddling, loan repayment or amateur acting, depending on whether a ghetto transaction, bank or theater script controls the information processing. These are obviously inferential constructions, and clearly show how conclusions can be drawn with nonverbal schema (see Wyer & Carlston, 1979, ch. 2).

Up to this point, my intention has been simply to describe dual coding theory--its major tenets and its links with other useful ideas. In doing so, I have omitted most discussion of the proof for the theory, believing that a more detailed treatment would interfere with the explanations. In the remainder of this section, I will review some of the main lines of empirical research which give evidence that dual coding theory is true.

To begin with, we know that concrete materials receive different treatment in memory than is accorded to abstractions. In general, concrete passages are better remembered than abstract ones (Paivio, 1971, pp. 453-454). Quite a bit of work shows the memorial superiority of imagery strategies to others (Paivio, 1971,

ch. 10). Imagery works best with concrete items, while verbal associations are more helpful with abstract word lists, as dual coding theory implies (Paivio, 1971, pp. 127-132, 390).

Whenever it is appropriate, imaging has a powerful effect on cognition. Reynolds (1966; 1968) illustrates this in several studies which required subjects to learn to associate nonsense syllables with occupations. Subjects did much better when they had previously seen maps with the nonsense syllables located in appropriate places (e.g., the syllable for policeman might be near a police station). Learning with the map is faster and more accurate; the better and more coherent the map is, the greater advantage it imparts. These studies suggest the importance of memory schemata. Petelle and Petelle's (1979) study makes a similar point. They gave subjects either verbal descriptions or visual depictions of checkers in various board positions. For complex situations, memory was markedly better in the visual information conditions. If imagery and verbal information were coded in the same way, of course, such a result would not occur. Related work has been done by Barresi and Silbert (1976), who gave subjects paired associate lists of high-imagery nouns. Before each pair, the subject would be told either to image the pair or to repeat it. Imagery was found to improve learning, when compared to repetition; imagery also interfered less with recall of other pairs.

Several researchers have investigated cognitive responses to objects and/or their names. Wimer and Lambert (1959), for instance, used a paired associate task where subjects learned to associate nonsense syllables with either common objects or their names. Though the objects and their names were equally meaningful (as rated by counting the number of verbal associations freely produced in 60 seconds), several important differences emerged. Most notably, the object paired associate lists were better learned, and the objects were found to have greater semantic distance from one another (measured with semantic differential scales) than had their names. The theoretical significance of the finding that objects and their

names are equally meaningful is that the better learning apparently did not occur because subjects get more information from an object than from its name; having discarded this possible explanation, we are left with the strong suggestion that the stimuli are coded differently. Dominowski and Gadlin (1968, exp. I) required subjects to learn paired associate lists where a number was associated with the picture of an object, the object's name, or the object's category name. Picture associates were learned sooner and more accurately, followed by object name and then category name associates; this is also the high to low imagery ordering. As noted earlier in this paper, subjects reported using visual imagery most often for pictures and least often for the category names, which were the most abstract stimuli in the study. Of course, these results are those which dual coding theory predicts. Other work has shown that children also have better memory for objects they've seen than for those which have only been named (Kee & Davis, 1979), though whether it is better to touch objects is not yet clear (cf. Kee & Davis, 1979; Richardson, Ainsley, Copsey & Watkins, 1980). All these findings do indicate plainly that visual and verbal information are learned and remembered differently, and are generally in accord with predictions from dual coding theory.

Some particularly dramatic evidence for the theory comes from research on interference effects. It is well known that humans have a limited capacity for processing information (Broadbent, 1965), and that errors of some sort will occur if demands exceed abilities on a given task. If we have only one coding system, then visual and verbal demands should generate equivalent mistakes whether a subject is doing verbal or visual tasks. Brooks (1968) tested these assumptions. His subjects memorized a sentence, and then processed it verbally by deciding if each word was a noun or not (or an article or not, in another condition). Responses were made verbally ("yes" or "no") or nonverbally (by gesturing). Results showed more difficulty in responding verbally than nonverbally, indicating that the verbal responses were interfering with information processing much more than nonverbal

responses. In another condition, subjects visualized a figure and made verbal or nonverbal responses. Here, the nonverbal responses were more difficult, again showing same-mode interference. Segal and Fusella (1970) replicated this effect. Their subjects generated a visual image (e.g., a tree) or an auditory one (e.g., a phone ringing), and tried to detect visual or auditory signals while the image was present. Detection was worse whenever the image and the signal were in the same mode. Since visual information is nonverbal, while the verbal system is auditory (Paivio, 1971, ch. 5), these results support the theory that we have two coding modes, and two coding systems. Finally, Sullivan and Turvey (1974, exp. III) asked subjects to recall a pattern of stimulations applied to their hands. Recall followed 16 seconds spent doing arithmetic problems presented either visually or aurally. The visual task impaired recall more than the aural task, again suggesting the existence of different processing modalities.

In addition to such evidence describing interference phenomena, dual coding is also supported by work showing some positive effects due to manipulation of verbal and nonverbal materials. D'Agostino and Small (1980) taught subjects which half of a word pair was "correct," and then after such learning had taken place, recombined the words into a second list which paired together previously "correct" words. Subjects had to learn which half of each pair was "correct" for the second list; in this paradigm, of course, some previously "correct" words will be wrong in the second list. Generally, subjects learning the second list will show negative transfer effects--learning will be impaired since once-correct responses are now incorrect. But in this study, half the pairs were word-word and half were picture-word. The usual negative transfer effect did occur for the word-word pairs, but not for the picture-word pairs. The explanation is that since subjects indicated their responses by pushing a switch (i.e., nonverbally), they never needed to recode the pictures into verbal terms, thus avoiding the negative transfer. A second study was done to test this interpretation. There, subjects indicated responses verbally

by naming the correct word or picture. This time, both the processing and the response required the same modality, and the negative transfer effect appeared.

Dual coding theory says that for images to be processed in verbal tasks, some sort of recoding must occur. Two studies seem to have identified such encoding. Coleman and Zenhausern (1979) tachistoscopically displayed pictures or words for subjects, and then showed another picture or word. Subjects had to decide whether the second item was the same or different than the target, and reaction time was measured. Reaction time was quickest when picture followed picture. The slowest reaction times were for picture-word and word-picture sequences. These are exactly the results predictable from the need to take an extra encoding step to compare verbal and nonverbal materials. Paivio and Marschark (1980) show the recoding effect in another way. They requested subjects to say which of a pair of animals is more intelligent. One block of comparisons was between pictured animals, and one between named animals. Reaction time for responses to pictures on the second block of trials was much lower if the first block had been with words. Paivio and Marschark explain that practice with the block of names made the words more easily available to subjects, speeding up the verbal labeling of the pictures on the second block. (The pictures had to be processed verbally because the task required abstract judgments of intelligence.) The researchers replicated this positive transfer effect for judgments of pleasantness of animals as well: picture reaction times were lowered after working with names, but not vice versa.

Several other lines of research seem to indicate that people encode and process nonverbal information in a fashion distinct from verbal processing. The symbolic distance effect is the well-established finding that size comparisons (i.e., which is larger?) are quicker when they focus on large differences between the two items (elephant-robin) rather than small differences (dog-cat) (Moyer, 1973; Moyer & Bayer, 1976; Potts, 1972; 1978). The effect has also been found for arithmetrical (Mayer, 1978; Ashcraft & Battaglia, 1978) and other judgments (King, Gruenwald &

Lockhead, 1978, though these results are somewhat equivocal). The Paivio and Marschark (1980) study summarized above also replicates this effect for both pictures and names, where intelligence differences were great or small. The effect seems to require some kind of perceptual or spatial encoding to explain why some responses should be quicker than others. Purely verbal encoding or processing could not explain why elephant-robin is quicker and easier than dog-cat. As a matter of fact, Paivio (1978, pp. 390-391) says that the symbolic distance effect occurs not only within categories (frog-wolf), but also across them. That is, mouse-toaster is easier and quicker than cat-toaster. Although a verbal category-link theory (e.g., Collins & Quillian, 1969) might begin to explain intra-category reaction time differences, surely a persuasive explanation of cross-category differences requires the assumption that the pairs are visualized and the larger item is "seen".

As Marschark and Paivio (1977, pp. 228-229) observe, mental rotation studies also support the existence of visual encoding. In these experiments, subjects have to make judgments which require them to use information from visually-presented objects. The difficulty of these tasks, and the time it takes to perform them, correspond closely to what would be expected if subjects were rotating the objects mentally, rather than making abstract inferences of some kind. Shepard and Chipman (1978), in related work, found that subjects' comparisons of the similarities of U.S. states correspond to the states' actual shapes, regardless of whether the stimuli were names or map outlines. This, too, suggests that people work with images rather than words in certain tasks. Experimenters working with linear syllogisms ('A is taller than B, B is taller than C, who is tallest?') also find results suggesting that people naturally form spatial orderings at some point in their processing of such verbal problems (DeSoto, London & Handel, 1965; Sternberg, 1980).

As a final bit of evidence, we note that verbal and nonverbal materials are processed in different parts of the brain (see Andersen, Garrison & Andersen, 1979,

for a review). Our left hemispheres deal with verbal, sequential stimuli, while our right hemispheres process spatial, nonverbal information. The two hemispheres can operate independently, as can the two coding systems, and are coordinated by messages sent through the corpus callosum, just as information can be dual coded. Just as we do not yet know what code is used in the corpus callosum we do not know how the verbal and nonverbal coding systems communicate with one another. Hemispheric research therefore provides physiological evidence for dual coding (Paivio, 1971. pp. 113-116), and is indirectly supported by the finding that verbal and nonverbal abilities are factorially distinct (Paivio, 1971, ch. 14).

This selective review yields a variety of reasons for accepting dual coding theory. Imagery and concrete materials seem to recieve different cognitive treatment than abstract verbal information. Verbal and visual effort do not interfere with one another as much as they interfere with themselves. Therefore, if intra-modal interference can be avoided, so can some well-known negative transfer effects. The time required for dual coding (necessary if verbal responses are to be made in a visual task) has been measured. The symbolic distance effect, mental rotation tasks, and linear syllogisms all produce results pointing to the spontaneous use of nonverbal problem-solving strategies. Hemispheric research actually holds out the promise of direct physiological confirmation for the theory. Any one of these lines of research can be interpreted in ways irrelevant to dual coding theory, but taken together, they comprise a strong circumstantial case. As a last bit of personal evidence, try to deduce how many windows your house has <u>without</u> imaging it. Then try to <u>image</u> the theoretical relationship between this paper and the others on the program. One task seems naturally visual and the other naturally verbal. Working in the "wrong" mode is extremely difficult. How could these qualitative differences exist in a single coding system? Dual coding theory seems extremely plausible.

Dual Coding and Reasoning

Having two coding systems--coordinated in some ways and exclusive in others--can either improve or impair our reasoning. Arguing well requires both creativity and discipline: creativity, to invent arguments and alternatives; discipline, to test and temper our claims. The nonverbal modality is more adept at creating new observations, since it processes information imaginally, in parallel. Imagery, to a great extent, "is free of logical restraints " (Paivio, 1971, p. 38), while the verbal code is sequential, logical, more strenuously restrained. As Horowitz (1970, p. 291) notes in the context of using images in therapy, "Censorship over verbal material is keen. Censorship over images is often less meticulous, and the patient may convey information without acknowledgment or without having to recognize officially the implications of the images." But this division of labor--images create, words reason--is not absolute. We can generate new awarenesses and make new implications while using our verbal modes, and we can reason correctly while working with images. Nonetheless, modal specialization is a fact of argument--a fact which can be respected or exploited.

Consider first the cognitive scripts we apply in processing information. The script has both verbal and nonverbal elemetns in it, and it labels/comprehends an episode once it has been matched to an appropriate script. The script then tells us how to act, what to say, what to think. Interpretation of ambiguous episodes involves a choice among several potentially available vignettes (Is one's spouse kissing a friend, a lover, a relative? Or has he/she stumbled into a stranger's face?).

Scripts are stored in memory, and are retrieved only after a search of some kind. Possible scripts are probably brought up into short-term memory, skimmed for relevance, and then either returned to long term storage or used (see Atkinson & Shiffrin, 1971). This search-and-evaluate process can easily be influenced. Wyer and Carlston (1979, pp. 39-41) point out that when several scripts are potentially

useful in a given situation, one of them can be "primed" by encouraging its earlier use. Thus, to interpret an ambiguous episode as one of bribery, its description ought to be preceded by one or more clear examples of payoffs. This will cue up the bribery script, and the audience will naturally fill in all the inferences from behavior necessary to convert a bag of money into a bribe. Another characteristic of script processing is that the script is most likely to be stimulated by the first relevant information (Wyer & Carlston, 1979, pp. 38-39). I have different reactions to a teacher who steals than to a thief who teaches. This "quick-cuing" seems consistent with our general tendency to simplify things "in the service of cognitive and emotional economy" (Jones & Thibaut, 1958, p. 152).

Scripts may vary from the very abstract to the very concrete (Abelson, 1976). The Toulmin model and the pentad are probably examples of abstract scripts for most readers of this paper. But once having noticed that scripts can be abstract, it then becomes appropriate to say that they seem most closely related to nonverbal, imaginal thought. Scripts, after all, are invoked in actual situations, and are very often episodic (as opposed to semantic). We should therefore expect scripts--with all their power to add implication to perception--to be intimately related to concreteness.

Consider the class of reasoning mistakes which might be called evidence-weighting errors. This type of error occurs when subjects undervalue or ignore certain information, and overemphasize other material. For example, when subjects are told the true outcome of an event and are then asked to estimate the probabilities of various outcomes, they can't discount the true outcome information, even when they are told to do so (Fischhoff, 1975; 1977; Slovic & Fischhoff, 1977; Wood, 1978). Another example is the conservatism effect. This occurs consistently when people estimate the odds of something, are given new relevant information, and then revise their estimates. The revisions tend to be too conservative: that is, the new information is undervalued (Edwards, 1968; Wyer, 1975; Branthwaite, 1975). A last

instance of evidence-weighting errors occurs when people are given baseline information on some event's likelihood and a nonconforming (i.e., atypical) example of the event. Subjects tend to allow the example disproportionate influence over their eventual judgments about what things are likely to occur (Tversky & Kahneman, 1974; Nisbett & Borgida, 1975; Carroll & Payne, 1976).

Some, if not most, of these errors can be explained in terms of concrete scripts. People tend to fasten onto the episodic materials in order to form images that will allow them to envision the events in question (Abelson, 1976; Wyer & Carlston, 1979, p. 59). Imaging this script is easier than working with an abstract, hypothetical one, and so subjects prefer to think in the nonverbal mode in these tasks. Of course, this preference is not an absolute one, or else people's estimates would conform exactly to image's implications. In fact, people do attend somewhat to baseline and other abstract information. The errors apparently occur when the implications of the imaginal script are integrated with those of the verbal modality. This analysis shows one implication of dual coding theory for reasoning: images stimulated by concrete material can exercise significant influence in a reasoning task, even when the concrete information is only marginally relevant to the problem. In such a paradigm, an increase in imagery can lead to fallacy.

The importance of concreteness to memory is also illustrated by the conceptual peg hypothesis. Briefly, this means that one especially salient part of a message or event will serve as the peg on which other memories hang. Kusyszyn and Paivio (1966) demonstrated this phenomenon with a paried associate task. Using pairs of nouns and adjectives in either a noun-adjective or adjective-noun order, subjects had to learn the lists of pairs, and provide one word when cued with the other. In spite of the fact that the adjective-noun order is the natural one in English, the noun-adjective order was learned better. This was interpreted as evidence that nouns make better conceptual pegs than adjectives. Paivio (1971, p. 80)

gives supportive evidence for this interpretation. Subjects rated the imagery value of 1318 words. Nouns had a higher mean rating than other classes of words: ratings ranged from 4.60 for nouns, to 3.52 for adjectives, 3.30 for verbs, 3.03 for pronouns, 2.41 for adverbs and 1.79 for function words. Nouns are easier to image than adjectives, and therefore make better conceptual pegs for memory. Paivio (1971, p. 448) also notes that the actor in a sentence tends to be the conceptual peg, even when the sentence is in passive voice. The importance of this for our purposes is that the actor or some other concrete entity in an argument will tend to be the conceptual peg. In addition to being used to support memory for the remainder of the argument, the peg's image will of course fill out according to its usual script. A rhetor could therefore cue a particular image or script merely by surrounding the appropriate concrete item with an abstract context. If the script's implications are predictable, much can be left unsaid.

Another implication of dual coding theory for reasoning has to do with the distinctiveness of words. Readers will recall Wimer and Lambert's (1959) finding that semantic differential ratings showed that objects were more different from one another than were their names. That is, "cat" and "dog" have less semantic distance beteeen them than would the actual animals. Paivio (1971, pp. 288-289) reports that in general, the higher the imagery value of a pair of words, the easier it is to distinguish them. This implies that word substitutions in an extended argument will be much easier and less detectable with abstract materials.

Begg and Paivio (1969) conducted an important study which tests this possibility. Subjects heard ten sentences of high or low concreteness embedded within a list of fillers. Then the sentences were read again to subjects, sometimes with semantic changes (subject and object reversed) and sometimes with lexical changes (synonyms inserted). Subjects had to say if the sentences had been altered. Results showed a significant interaction: semantic changes were much easier to detect in concrete sentences, and lexical changes were more apparent for abstract

wording. These, of course, are the predicted results. Concrete sentences yield images, which ought to be indifferent to synonym substitution; abstract sentences have to be stored as chunks of words, and a new word would stand out. A meaning change, on the other hand, would produce a sentence which would not match the concrete image, while merely moving a noun from object to subject might not be noticeable within the same list of words. These results confirm the reasoning of the previous paragraph, and have these implications for argumentation: an increase in imagery will increase people's ability to detect a meaning-changing equivocation, but will reduce the likelihood of noticing that one word or phrase has been substituted for another. Either tendency can be used to lead or mislead a listener.

Although it would be an exaggeration to say that logic has nothing to do with imaginal processing, the nonverbal modality is certainly less restricted than is verbal reasoning. Paivio (1971, p. 38) speculates that images give off more associations in less time than words do, and remarks that purely imaginal thought is only restrained by logic when verbal processes are "superimposed" on it. We have already noticed similar judgments from Horowitz (1970, p. 291) and Wyer and Carlston (1979, pp. 41-42). Nonverbal thought seems to be inventive, intuitive and unrestrained. Associations are only controlled by their proximity to the conceptual peg; the editors for propriety and justification seem to be post hoc, verbal controls. How many times have we nodded, smiling, at a grotesque caricature of a President on an op-ed page, and later reflected that the cartoon was a cheap shot? This suggests that putting an argument in concrete terms, moving from image to image rather than proposition to proposition, might well bypass many cognitive defenses. Images stimulate listeners to fill in scripts themselves, to draw their own conclusions in intuitive, undisciplined ways. And we know that conclusions generated by an individual are more memorable than message statements (Slamecka & Graf, 1978) and also have more influence over final judgments and opinions (Love & Greenwald,

1978; Jaccard & Fishbein, 1975; Greenwald & Albert, 1968; Petty & Cacioppo, 1977; Raye, Johnson & Taylor, 1980). "Own beliefs" are powerful cognitive energies, and dual coding theory suggests strategies which tap them.

Images are obviously idiosyncratic to a great degree, but in some respects their form and operation are predictable. In working with linear series of comparisons ("A is taller than B. . ."), DeSoto, London and Handel (1965) found not only that subjects tended to use spatial images to solve the problems, but that some consistent patterns appeared across subjects. "Better than" comparisons work vertically, from top to bottom (try it: Al is better than Bob, Bob is better than Carl, who is best?), while "worse than" series go bottom to top. Vertical axes are generally more useful than horizontal ones. But within horizontal orderings, the left to right movements are much easier than right to left. Miller (1969) reviews research showing this last effect. One of these syllogisms is far more difficult than the other:

A is to the left of B	A is to the right of B
B is to the left of C	B is to the right of C
Is A to the left of C?	Is A to the right of C?

The strain involved in solving the right-hand problem is due to a violation of the way we prefer to visualize the premise information. We have repeatedly noticed that one characteristic of a message--concreteness--influences people's information processing. It now appears that with proper anticipation of subjects' images, certain presentational forms can facilitate correct or mistaken problem solutions.

Of course, a basic tenet of dual coding theory is that concrete stimuli tend naturally to be processed as images, and abstract stimuli are handled verbally. But when forced to do so, people can process materials in the "wrong" way. Particularly interesting are the ways people try to image "because" and "if"--two key words in argumentation. Werner and Kaplan (1963, pp. 457-466) report results of studies in which subjects were given sentences containing "if" or "because" and

asked to form images. Subjects' descriptions of their images illuminate common weaknesses in the understanding of causality and conditionality. In the causality images, temporal sequencing was very prominent. To represent 'A because of B', B must be first in the image. For some adult subjects an image which can be condensed verbally to 'B first, then A' was sufficient to show causality. Others' images merely linked A and B together inseparably. Though some respondents managed to achieve useful images--'B produces A' for instance--the images of most allow enormous room for post hoc ergo propter hoc fallacies. Images for conditional relations--'A if B'--were even less successful. Often, subjects simply left out either A or B (interestingly, the retained part tended to be more concrete). Most often, the idea of conditionality didn't find any representation in the image. People tried 'B, then A', 'B with A', 'A with B', A or B as an example of the other, or 'B containing A'. One particularly intriguing interpretation was simply 'neither A nor B'. For example, the sentence "He would pace a great deal if he worked hard," could be represented as "A loafer sitting on a bench rather relaxed." Here, too, the possibilities for fallacy seem nearly unlimited. These results all suggest that both causality and conditionality will frequently be mishandled if they are imaged or if they refer to elements of an image.

In trying to show some of the ways concreteness may be related to reasoning, this section may well have given the impression that concrete problems are more likely (than abstract ones) to be solved fallaciously. In fact, empirical research seems to indicate that the opposite is true--that concrete, familiar problems tend to be dealt with more easily and more accurately (Williams, 1979; generally see Wason & Johnson-Laird, 1972, p. 243). Actually, I think that the body of research discussed in this paper shows that either generalization about the superiority of concrete or abstract materials is oversimplified. Whatever advantage exists is probably an interactive one, and should depend on a large number of variables:

imagery value of materials, complexity of problem, individual differences in imaging, sensory modalities for input and output, time elapsed between problem presentation and solution, and whether spontaneous associations support a valid or invalid conclusion. No doubt other variables could also mediate the relation between concreteness and problem solving accuracy.

A Limited Theory of Fallacies

This final section contains a limited theory of fallacy--"limited" because it makes no claim to account for all instances of all fallacies. The purpose of this theory is to harness the results of dual coding research and use them to provide a testable, coherent account of at least some fallacy phenomena.

The theory begins by noticing that the idea of stimulus concreteness can be replaced by the metaphor of distance between the symbol and the thing symbolized. Werner and Kaplan (1963, ch. 3) use this figure to describe individual growth: Children do not distinguish between themselves and the objects in their environments. As they grow, they begin to see that objects are different from self, and finally they realize that objects can be represented by symbols (concrete ones at first). Burke (1961, p. 301; 1966, pp. 7-9) emphasizes that this substitutability is an important function of language. Through language, we can substitute words for things, words for words, and things for each other. Burke's point of view implies that we always have choices to make in substituting for, or symbolizing, an idea or object. We can move verbally or nonverbally, proximately or distantly. One result of a particular substitution will be to increase or decrease the presence of the idea in question (Perelman & Olbrechts-Tyteca, 1969, esp. sections 29 & 42).

The distance between the object and the symbol substituted for it determines the thing's presence. With some symbols, this distance will be small. For example, suppose that a speaker uses a physical object--an urn--to substitute for the class of urns. Here the distance is short. For other symbols, the distance enlarges. The speaker may simply mention urns, and let the word symbolize the

objects. Or he/she may speak of wine jars, containers, pottery, artifacts, etc. At each step, distance increases and presence declines.

I hasten to insert here the qualification that presence and distance are not characteristics of text. They are subjective phenomena. However, they are extremely predictable, for they rely on people's understandings of symbols as being concrete or abstract. These understandings are reasonably consistent across individuals, as the whole body of dual coding literature indicates. Therefore, we can closely approximate concreteness and related variables by examining text; even so, the final arbiter of presence is the argument's "recipient" (i.e., the person who is actually thinking through it).

Extreme values of presence encourage the audience to overlook the fact of substitution. Generally, presence is expected to increase as the symbol-symbolized distance shrinks. The substitution of the word for the thing becomes more automatic, more reflexive, until the audience willingly accepts the symbol as the symbolized. Thus, very concrete usages increase presence by hiding the substitution from the audience. A different result may occur when the distance between symbol and symbolized is so great that the audience finds it difficult to identify what is being symbolized. Either through indolence or inability, the audience uses verbal processing and so treats the message as a series of word objects, rather than as a field of real objects. Either way--through very short or very great distance--attention is focused on the words, and away from the fact of substitution. In one case, the result is an image, and in the other, people process highly abstract materials having unclear referents.

To stretch our metaphor a bit further, we might say that the awareness of substitution is intimately related to the coordination between our two coding modalities. With great or small distance, processing is self-contained in one code or the other. Only with awareness of the symbolization process are the

creative energies of the nonverbal system disciplined by the sequenced march of verbal analysis; only in this case are both strengths available. Presence directs attention to an image; lack of it encourages solely intraverbal manipulation.

At last, it is time to put forth a general typology of fallacy. In its current stage of development, it does not claim to cover all fallacies, or even to explain all instances of the fallacies it does include. Nonetheless, it brings together rhetorical techniques which, based on dual coding theory, seem very likely to mislead systematically. The two classes of fallacy are those which increase concreteness, and those which increase abstraction. This typology is more than a simple dichotomy because it is based on a causal theory--that under the appropriate conditions a change in concreteness raises the likelihood of adherence.

Concreteness Fallacies

As in the other general class of fallacy, the concreteness fallacies depend on the rhetor moving out of neutral modes of expression. By "neutral" I mean only that the message stimuli are appropriate to the coding system which is most likely to process the information correctly. In the case of concreteness fallacies, the move is in the direction of greater presence, more concreteness, a higher incidence of imagery, than in the neutral discourse. The increased concreteness may be for the argument's topic, or may be in favor of something else.

As a first example, consider identification (Burke, 1950, pp. 19-23). This is a powerful persuasive technique which encourages listeners to agree with suggestions made by a rhetor because he/she is admirable or similar to the audience. This can be a fallacy because "I was a farm boy myself" does not ordinarily provide direct proof of the claim at issue. Identification functions only after the rhetor has managed to attach great presence to his/her persona. By talking about oneself, by exhibiting one's values, by having an introductory speech to detail one's background, the rhetor increases his/her own concreteness and imagery value. Thus

the rhetor becomes a model (see Perelman & Olbrechts-Tyteca, 1969, sections 80-81), and the audience imagines that they are one with the speaker. This represents a regression to the child's failure to perceive distance between self and objects (Werner & Kaplan, 1963, ch. 3). The whole effect comes about because the audience's attention has been distracted from the argument, and focused so as to hang from the peg of the speaker. Consubstantiality provides a ground for persuasion, but not for proof. Providing special presence for the speaker, reducing the distance between speaker and audience, gives a false image of how the reasoning is to be done: the audience imagines themselves as the speaker, moving glibly from claim to claim. This analysis also covers slightly different phenomena--appeal to authority, prestige suggestion--which appear on many fallacies lists. However, identification seems to me the archtypal process.

A second way that an increase in concreteness might systematically mislead is through suggestion. Merely by asserting that a thing is true, if the assertion is couched in concrete terms, encourages the audience to visualize it. Once having "seen" the thing, the audience is much more prepared to believe it. In some cases, the rhetor may wish to encourage a particular construction of something which has been actually seen. To accomplish this, the speaker need only stimulate use of the appropriate script to process the information. As we saw earlier, scripts may be primed without even discussing the matter immediately at issue; therefore, the speaker need not suggest the script's application explicitly in order to suggest it effectively. Though we tend to regard classification as a verbal operation, notice that script changes (i.e., substituting one script for another) amount to a reclassification of the materials in question. These are fallacies because the ability to imagine a thing does not prove that it happened, or that it happened in a particular way. Suggestion can evoke presence for a new image with a new load of associations.

Images can also be misleading when they encourage absolutism. Modal terms--probably, usually, etc.--are verbal, and we would not expect them to be faithfully

processed in the nonverbal code. The image for "The VW probably went off the cliff" is a flying, rock-bound VW for most people. Adverbs, the reader will recall, are much less concrete than nouns, and so it is the noun which serves as the conceptual peg for the image. Even if the speaker makes the qualifications responsible discourse requires, a sufficiently vivid description will encourage the audience to form an image which leaves no room for modals. It is the function of the verbal code to provide this kind of restraint; nonverbal reasoning escapes it. The related fallacy of exaggeration can operate in a similar way, through the evocation of sharp, seductive, extreme images. What can be seen can be believed.

One fallacy for which previous empirical research provides sound documentation is the contrary instance. This is based on the evidence-weighting problems discussed earlier in this paper. Given a choice (metaphorically, at least) between dealing with probative abstract materials or misleading concrete ones, people prefer the image. A speaker can present huge quantities of elaborate economic statistics--the more the better--and give a detailed description of one family fraudulently living on unemployment compensation, and rely on that one image to have disproprotionate impact on the audience's attitudes. The vivid example may be completely contrary to the abstract verbal material, or it may only distract the audience into a realted but misleading script. In the latter case, the fallacy would be similar to suggestion.

The fallacy of the forced image occurs when an audience is stimulated to image a naturally verbal problem. In the previous section, we examined the results of studies which called upon adults to image causality and conditionality. In both instances, the images were logically incomplete and, by extension, easy to manipulate. Causality is easier to "prove" if the audience's criterion is limited to temporal ordering; post hoc fallacies should be easy to commit successfully with concrete images. Subjects' difficulties in imaging conditional relations suggest that most of the classic fallacies will be tempting with concrete materials.

Concreteness may be harnessed in a final way. We have already noticed that certain kinds of problems reliably elicit spatial schemata, and that violation of those schemata makes the problem much more difficult (recall the 'A is to the right of B' example from the previous section). A speaker may intentionally cue up the schema and violate it, in order to make an opponent's argument hard to follow. This would be the fallacy of schema confusion. Though the number of opportunities for its use are probably limited, the solid research on these matters suggests that the effect will be a reliable one.

Any fallacy is dangerous, but several of those described in this subsection are especially so, because they allow the speaker to say all of the correct things while still misleading the audience. Dual coding theory suggests that so long as an attractive image is available, the presence of that image will cast an impenetrable shadow over modals, qualifications, or abstract lines of reasoning. Thus the speaker can commit fallacies while using a perfectly defensible text.

Abstractness Fallacies

In order to achieve certain effects, the rhetor may choose to make the text more abstract than the neutral version. Such a move will decrease the presence of whatever had previously been concrete, offering the opportunity to reverse the concreteness fallacies (just as the ones to follow could be corrected by raising the concreteness level of the text). An increase in abstraction makes verbal processing the natural modality, and lowers the likelihood of powerful images. In general, any correct reasoning which relies on nonverbal processing can be avoided by keeping auditors in the verbal code.

The fallacy of confusion is perhaps the most general one to be discussed. It relies on the finding that meaning changes are less easily detected in the verbal than in the nonverbal code (Begg & Paivio, 1969). The speaker can obscure an opponent's position by using familiar words in the wrong places. No argument can

be massacred in that way and still be able to defend itself in recipients' minds. Under some circumstances, a rhetor may confuse his/her own arguments to make them untestable; adherence to the conclusion might then be sought through some other fallacy, such as prestige or suggestion. (Straw man strategies seem more attractive in the verbal than the nonverbal mode: it may be easier to leave out an essential part of a verbal argument than to exclude an essential feature of an image. But this is speculative.) Most teachers can draw upon their own personal experience to confirm the following claim: an audience exposed to a confusing, highly abstract argument will often let it pass, waiting for something simpler to work with. So the fallacy of confusion may operate by putting verbal units in the wrong places, by leaving out essential links, or simply by using expressions so abstract as to make no impact on the audience. Any of these techniques will "help" the speaker over the rough spots in a two-sided message.

Equivocation makes use of a key word's "other" meanings, and relies on them to support an argument. Words spontaneously elicit other verbal associates--this is how intraverbal meaning occurs. Normally, the audience will focus on the one appropriate meaning, and the others will drop by the wayside. The speaker could keep those other associates cued up, however, by using a number of what we might call second-order associates in close proximity to the key word. Suppose, for example, that one speaker wanted to indict another's "program" of welfare. In this context, the associates to (television) programs--entertainment, silly, fiction--would normally fade. But if the speaker found a way to talk about entertainment, television or words associated with these, the valences and implications of these second-order associates might be made to modify the "program" under discussion. Of course, grosser examples of equivocation--'an opponent had a gay time,' 'of course this house is dearly priced'--are also possible with verbal processing.

Highly abstract processing may also be vulnerable to word substitution,

provided it is done in the context of elaborate argumentation. One can ascend and descend the ladder of abstraction without returning to the same place. To give a simple example: a horse can become a pony by the end of a discussion if it is a steed, or an animal, or transportation, for most of the discourse. This fallacy depends on memory failing for the key word, so the speaker needs to take precautions against repetition, concreteness or other memory aids. Of course, if the substitution is tried too quickly, it will easily be detected (Begg & Paivio, 1969). The speaker is much less likely to be caught in the substitution if an elaborate and more abstract set of usages intervenes between the target word and its substitute. In this way, the speaker can work with more convenient words--those with favorable or otherwise useful associations. This fallacy can become firmly entrenched if the substituted word happens to be more concrete than the original one.

Lastly, consider the fallacy of the enlarged domain. Abstraction usually involves generalization. The speaker will normally be referring to larger semantic domains as abstraction increases. For instance, to prove that Datsuns are overpriced, a speaker might claim that Japanese products have great expenses for transportation and import duties, that Japanese products use inferior materials than U.S. products, and that the weakness of the dollar relative to the yen requires us to pay too many dollars to buy one unit of foreign value. If we abbreviate D for Datsun, J for Japanese products and E for expensive, the structure of this argument is the familiar 'all D are J, all J are E, so all D are E.' The problem lies in the assumption that all things true of J are true of D: the second premise. A speaker can easily prove that 'J are E' and so encourage the audience to believe that '<u>all</u> J are E.' This fallacy will be easier to accomplish as J becomes more abstract. The fallacy will also be facilitated if D can be abstracted as well. The main "threat" to this fallacy is the possibility that listeners will keep the concrete

D in mind and continually check it (instead of J) against E. Another way of describing this fallacy is to regard it as an illicit premise conversion or a misunderstanding of the premise (cf. Henle, 1962; Neimark & Chapman, 1975). On the basis of the work reviewed in this paper, however, such errors ought to be more tempting as abstraction increases and the semantic domain enlarges.

As with several of the concreteness fallacies, some of these abstraction techniques can be executed without use of a text which actually lies or commits formal, obvious fallacies. The text need only cue some responses and impede others. The audience commits the fallacy; the speaker doesn't.

Discussion

In a way, both the concreteness and abstractness fallacies are mixed modality fallacies, or at least could be. To make concrete material abstract is to shift the audience from nonverbal to verbal coding, for instance. However, the preceeding fallacies are not necessarily mixed mode: slightly abstract material could be made extremely abstract, for example. The causal force in all these fallacies is an increase in either abstractness or concreteness, not the modality change. Extreme changes, however, could produce modality shifts.

In experimental results, such a shift may be reflected in some kind of discontinuity in the data, since the move from one mode to another may be abrupt rather than gradual, at least for children. Adults may coordinate their coding systems well enough that the data change only gradually. These observations suggest a way to calibrate modality coordination, which would probably go a long way toward predicting individual vulnerability to these fallacies.

The main advantage to this theory is, in fact, that it is testable. It is based on a body of research which indicates appropriate experimental designs and manipulations. In contrast to our usual lists of fallacies, the one described here has the virtue of being based on a causal theory (a change in concreteness alters the likelihood of error), rather than a mere distinction (e.g., formal/material).

However, this is only a limited theory, and it does not make other claims. For instance, I do not know whether it explain all fallacies, or only a few. In earlier drafts of this paper, I attempted to recast the usual fallacy types into the terms of the theory, and generally I can do it--but sometimes the interpretations seem contrived, even to me. I think this will only be a profitable exercise if we find empirical support for some of the more obvious types described in this paper. I am also unprepared to say whether the theory explains all the instances of the fallacies it does cover: post hoc and equivocation, as cases in point. In short, the boundaries of the theory have not yet been stated, and probably should not be until some testing has been done.

Nonetheless, the theory is valuable even if it proves to have extremely small scope. It provides a systematic explanation of some interesting phenomena, and does so in cognitive terms. Even if it proves to be a small step, at least we will have moved away from arbitrary lists of textual events.

A final point which might appropriately be raised here concerns the relation between fallacy and persuasion. An effective persuasive technique is one which systematically leads people to a conclusion, and a fallacy is a device which systematically misleads people to other conclusions. Both persuasion and fallacy rely on the same processes. The difference seems to have more to do with the conclusion for an argument than with its reasoning. I do not think that the techniques I've discussed here are moral or immoral, proper or improper. In a way, therefore, I have also presented a limited theory of persuasion, since the fallacies all depend on the ways people process message stimuli. We call certain of these patterns fallacies only because we have often noticed that people using them often arrive at the "wrong" conclusion. At the beginning of this paper, I noted and then set aside the problem of knowing whether a conclusion is right or wrong. It is a complex and subtle problem, and I will not try to resolve it now.

But whether or not we can ever say that a particular inference pattern is certainly fallacious depends on our being able to settle it eventually.

Summary

This paper has outlined a limited theory of fallacy. The theory tries to define some reliable relationships between message stimuli and people's cognitive reactions to them. Such a strategy is required by the general point of view adopted here, namely that fallacy is a cognitive event, not a textual one.

Dual coding theorists find that the rated concreteness or abstractness of a text reliably predicts the way the stimuli are processed. Concrete stimuli are handled nonverbally, usually with visual images. These images contain the stimulus--perhaps as the conceptual peg--as well as visually associated events. Abstract material is processed in the verbal coding system. In contrast to the nonverbal modality, verbal processing is sequential, disciplined and logical. Either an image or a series of verbal associations can constitute the meaning of a stimulus. Both modalities presumably use scripts or schemata to expand the meaning of the original material. Such processing is spontaneous.

By altering the concreteness of a message, a rhetor can determine which mode the audience uses for the text. Since the two codes operate differently, each has the potential to draw some kinds of inference and to miss others. The kinds of implications noticed in each mode are at least generally predictable. This means that the speaker can control what kinds of implications his/her text will stimulate by choosing the appropriate level of concreteness. Such control amounts to determining the presence of the material, or the distance between symbol and symbolized. Systematic manipulation of the concreteness of certain materials results in patterns of thought we have traditionally seen as fallacies. This observation was exploited here to generate the fallacy theory. That theory is based on the effects of concreteness, and promises to be empircally testable.

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